

AMERICAN SOCIETY FOR BIOETHICS & HUMANITIES

NASA Administrator Charles Bolden

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Thank you, Paul [Root Wolpe], and thanks to very much to all of you for allowing me to address this distinguished group ... I've been looking forward to coming here and meeting with all of you since my initial conversation with our NASA Senior Bioethicist, Dr. Paul Wolpe last spring. I saw some of you this morning at the great panel on the *Ethics of Research in Extreme Environments*, which featured my NASA colleagues Paul Wolpe, Victor Schneider, Rebecca Reed, Craig Kundrot and Lee Morin.

We at NASA have a saying: "space is hard." The issues with which you all grapple are perhaps the hardest. As we embark on a future in which we're seeking to push out further into the solar system, I'd argue that the toughest decisions we will face will not be technical (although make no mistake, those decisions are tough).

They won't be budgetary (although those decisions are tough, too). They won't even be legal or political. In my mind, the toughest decisions we will have to make will be *ethical*.

That's why I'm here today. I'm here because at NASA we take your work, very, very seriously. I'm here because we at NASA want to have a dialogue with you – or in many cases, to *continue* a dialogue.

SOMETHING BIGGER THAN OURSELVES

I'm very much looking forward to addressing your questions, and I thought I'd just take this brief opportunity to set the table a bit.

First, there are a couple quotes I've been thinking about a lot. I want to share them with you first and then I'll tell you who said them.

Quote: "*The first day or two up there,*" and by "up there" he means *in space*, "*you try to recognize the countries.*" Then the speaker names his own country and says, quote "*It stands out. It's very distinct. Then, you keep missing the countries and you look only at the continents. By the sixth day, the whole world becomes a beautiful blue and white and yellow painting. Those boundaries really disappear. With me they still are.*"

The second quote is this: "*There is no better place to emphasize the unity of people in the world than flying in space. We are all the same people, we are all human beings, and I believe that most of us, almost all of us, are good people.*"

Prince Sultan Salman Abdulaziz Al-saud of Saudi Arabia said the first quote after flying as a member of the STS-51G shuttle mission in June 1985. The second, by the late Israeli astronaut Ilan Ramon during his ill-fated STS-107 mission in January 2003.

I thought about these quotes a lot when I was in Jerusalem earlier this month for the 66th International Astronautical Congress. Amid the conflict that was happening, in some cases a few blocks away, there we were, an international community, coming together to be a part of something bigger than ourselves – furthering humanity’s presence into the universe and our understanding of our place in it.

I would submit to you that space travel and exploration are about something bigger than any individual, any individual nation, or even any individual generation.

It’s about leaving this world a lot better than it is today. It’s about the future of humanity. It’s about better understanding humanity’s place in the universe and answering the age-old questions about whether we are indeed alone. It’s about improving our understanding of Planet Earth, its changing climate and perhaps even about how to reverse the effects of climate change so that our grandkids and their grandkids will breath cleaner air and will be able to go swimming in oceans that haven’t dried up or become too polluted for swimming or fishing.

RISKS AND REWARDS

T.S. Elliot wrote, *“only those who will risk going too far can possibly find out how far one can go.”* As we reach for new heights, there are some benefits to humanity that can be quantified.

The list of everyday items that were originally invented for the space program is long and wide reaching. Everything from solar panels, shoe insoles, ski boots and adjustable smoke detectors, to cardiac imaging systems, advanced pacemakers and infrared thermometers.

Despite popular misconceptions, we didn’t actually create Tang or Velcro – although both have played an important role in our space program!

There are some benefits that are a bit more difficult to assign metrics in their entirety.

No one’s been able to come up with an accurate economic model on just how many jobs are supported by space exploration – and will be in the future – but what we do know is that it’s a lot.

Then there are the benefits to a population where parents are able to work one job instead of three and families have more disposable income to spend on groceries and school supplies and so forth.

With all this said, the truest rewards go beyond dollars and cents.

They are things like the beautiful international cooperation we see aboard the International Space Station – where, for nearly fifteen years, tens of thousands of people across fifteen countries have worked to make it possible for human beings from different countries to live and work together in space. (I've often thought the International Space Station should win the Nobel Peace Prize.)

We may never truly be able to measure how many people have been saved by medical technologies developed for space and what big, wonderful, impactful things these people did with their extra time on this earth. What we do know is that it's a lot.

We may never truly be able to fully measure how many lives have been changed because space exploration captured a young person's imagination ... but we know it's a lot.

When President Barack Obama spoke at the Kennedy Space Center in Cape Canaveral, Florida, on April 15, 2010 he told a story about sitting on his grandfather's shoulders as a young boy, so he could wave an American flag and cheer on the Apollo astronauts arriving in Hawaii.

How many young people watched the moon landing and were inspired to do something with their lives?

How many young people in the next generation will follow our *Journey to Mars* and alter the course of their own lives as it captures their imagination?

How many young girls look at the fact there are female astronauts and tell themselves, I can succeed at science?

I can tell you that when I grew up in Columbia, South Carolina during segregation I never conceived of the possibility I could someday be an astronaut (let alone Administrator of NASA working under the first Black President of the United States!) It's difficult, if not impossible, to quantify what it means to young Black students who now look at the fact there are Black astronauts and a Black president and are now inspired to go out and change the world too.

FIND SOMETHING TO BELIEVE IN THAT'S BIGGER THAN YOU

Speaking personally, I've been in positions over the course of my career when I've had to make life or death decisions. I volunteered for service in the United States Marine Corps and in the Astronaut Corps and I've been faced with the far, far more difficult decision of sending Marines into combat and astronauts into space.

Everyone draws upon their own sources of inspiration when they make these choices. In the Marines, the troops serving under me tended for the most part to consider themselves Christians, Muslims, Jews, or atheists. I tried to make the point to all of them – including those who did not consider themselves people of faith – to “find something you believe in that’s bigger than you”. Sometimes it’s a person. Sometimes you have faith in your commander. Sometimes it’s an idea or an ideal. Sometimes it’s a higher power.

DRAWING INSPRIATION

On a personal level, as I make these decisions, I think a lot about my Mom and Dad. My father was a teacher and coach and to make extra money to support us he used to referee football games. We all used to be very nervous when he’d come home late at night, knowing he’d have to travel through some tough white neighborhoods, knowing that in the days of segregation just being stopped by the police could have scary, if not tragic, consequences.

I think a lot about my squadron mates from Viet Nam, especially those who did not come back. Trust me, they knew exactly what they’d be getting into.

I think about my mentor and role model the late Dr. Ron McNair, who convinced me to apply for the astronaut program, and who we lost with his STS-51L crew on *Challenger* on January 28, 1986.

I think about Christa McAuliffe who I got to know well while we were training as crewmates for the STS-51L mission until a crew swap resulted in my NASA crew being shifted from the first Teacher in Space mission to another. People always wonder if astronauts go into space knowing what risk they were taking. I want to share with you an excerpt from a *New York Times* story dated April 21, 1986. I quote:

“Christa McAuliffe climbed aboard the space shuttle Challenger well informed of the risk she was taking as the first private citizen to participate in a space mission, according to Barbara R. Morgan, her backup for the flight. From the moment the two schoolteachers began the five-month training, Mrs. Morgan said, they were reminded many times, in many ways, of the hazards of space flight, particularly launching and landing ...

“In an interview in Washington last week, Mrs. Morgan, a 34-year-old teacher from Idaho, spoke of the training she shared with Mrs. McAuliffe, the accident and her continuing eagerness to fly in the space shuttle ... Mrs. Morgan said the Challenger explosion had not changed her attitude toward ... the prospect of flying in space. About three weeks after the accident, when NASA officials talked to her about their plans, she said she did not hesitate to volunteer to take Mrs. McAuliffe's place.”

In 2008, Barbara Morgan retired from NASA after logging more than 305 hours in space.

JOURNEY TO MARS (BRIEF UPDATE)

These are just a few of the things that I think about when I weigh these big, ethical decisions. As we begin our discussion here, I wanted to close by just giving you a very brief update about what we're working on at NASA and some of the ethical decisions that future Administrators and their citizen-bosses will have to make.

NASA is on a *Journey to Mars* and there is a new consensus that's emerging in the scientific and policy communities around our plan, timetable and vision for sending American astronauts to the Red Planet in the 2030s.

The *Orion* Spacecraft has now flown further into space than any spacecraft designed for human flight has gone in a generation. The Space Launch System, which will someday launch our astronauts into deep space, is hitting critical milestones. Astronaut Scott Kelly is spending a year in space aboard the International Space Station, which will allow us to study the effects on the human body from such a long duration off the Earth. Our latest robotic spacecraft *MAVEN* arrived in Mars orbit in September of last year to study the Red Planet and next year we'll be sending a new *Insight* lander to study the planet's core.

So things are happening and as we like to say at NASA "Mars Matters." It matters because it's formulation and evolution are comparable to Earth's. It matters because we know that at one time it had conditions suitable for life. It matters because it may tell us more about our home planet's history and future and it matters because it just might help us unravel the age-old mystery about whether life exists beyond Earth.

CONCLUSION: QUESTIONS THAT MUST BE TACKLED

An undertaking such as a *Journey to Mars* will necessitate a lot of big, ethical choices – some on which we may want to touch during our discussion today and all about which I hope that you'll do some thinking.

For starters, there's the question of whether we're willing to put the lives of human beings at risk, not just for the duration of the mission, but for afterwards by putting their post-flight quality of life into question. What will having gone through this experience mean for their quality of life once they get home? I say this not only thinking about things like exposure to radiation, but also factors like the psychological effects of spending years away from loved ones, or of living in small, confined spaces.

I think everyone who has been to space would say it's worth the risk. Sailors suffered from scurvy until a solution was found. Pilots flying at high altitudes have had to make adjustments for extreme cold and lack of oxygen. Astronauts have had to endure unplanned extensions to their space missions due to human and natural events. But no one has ever experienced anything like a multi-year, round-trip spaceflight to Mars.

Beyond that, how will we as a country grapple with the questions of risk and gender? Is it equity above all? Or are there other factors that will need to be weighed if the science tells us the mission will be more risky for women than men, or vice versa.

As I said up front – figuring out the technical and scientific challenges, that will eventually be the easy part. Space is hard. Space ethics is even harder. To me – the benefits of exploration and discovery far outweigh the risks.

I for one am really looking forward to hearing from you today and in the days, months and years ahead.

Thanks very much.